955449

Upgradient Slurry Wall Historical Data Summary

Velsicol Chemical Corporation Superfund Site

Former Plant Area – OU-1

Plant Site in Operation – 1970s

Plant Decommissioning – 1982

Consent Judgement – November 1982

- Specified construction of **site containment system**:

    1. 24-inch thick slurry wall keyed 30-inches into underlying clay till unit, permeability $<1x10^{-7}$
    2. 36-inch clay cap, permeability $<1x10^{-7}$
    3. Groundwater collection system
        - Maintain water elevation <724.13 feet above mean sea level (ft AMSL)

Slurry Wall Installation – 1983

1984 DNR Summary Report of Oversight Activities

- 1982 – Site Decommissioning and Consent Judgement
- 1983 – Slurry Wall Installation
  - Continuous DNR and EPA oversight to ensure construction per consent judgement specifications
- 1983-1984 – Site Cap Installation and Groundwater Collection System Installation

Slurry Wall Effectiveness Concerns

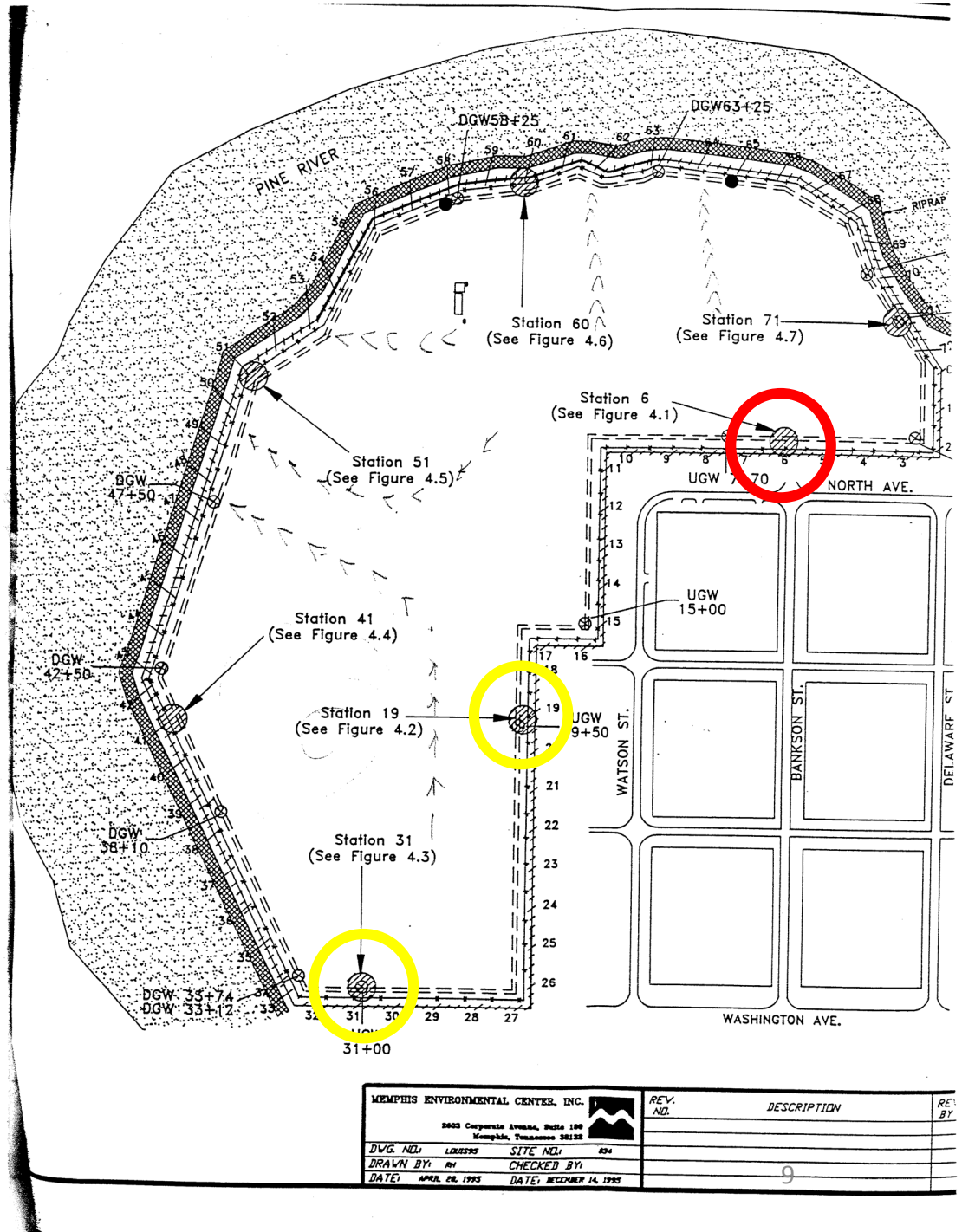
- Increasing water levels inside groundwater containment system
  - 2.53 million gallons water removed between 1993-1994
- Increasing DDT levels in fish within the impoundment
  - 1994-1995 fish sample DDT concentrations doubled since 1989

1997 MEC Containment Assessment Report

- 1995-1996 – Evaluation of slurry wall and containment system after effectiveness concerns
  - Interior and exterior inclinometers and interior settlement plates
  - Slurry wall material sampling for permeability – upgradient and downgradient
  - Interior and exterior slurry wall piezometer pairs for hydraulic gradient analysis
  - NAPL screening and dye tracer studies at piezometer pairs

Slurry Wall Sampling

- 3 locations sampled on upgradient side at 3 depth intervals
- Out of 9 samples, 2 samples at one location failed permeability requirements ($1.0x10^{-7}$)
  - 6-8 ft – $1.1x10^{-7}$
  - 25-26 ft – $3.8x10^{-7}$
- Spacing interval of sampling insufficient to evaluate effectiveness of upgradient slurry wall



Piezometer Pairs

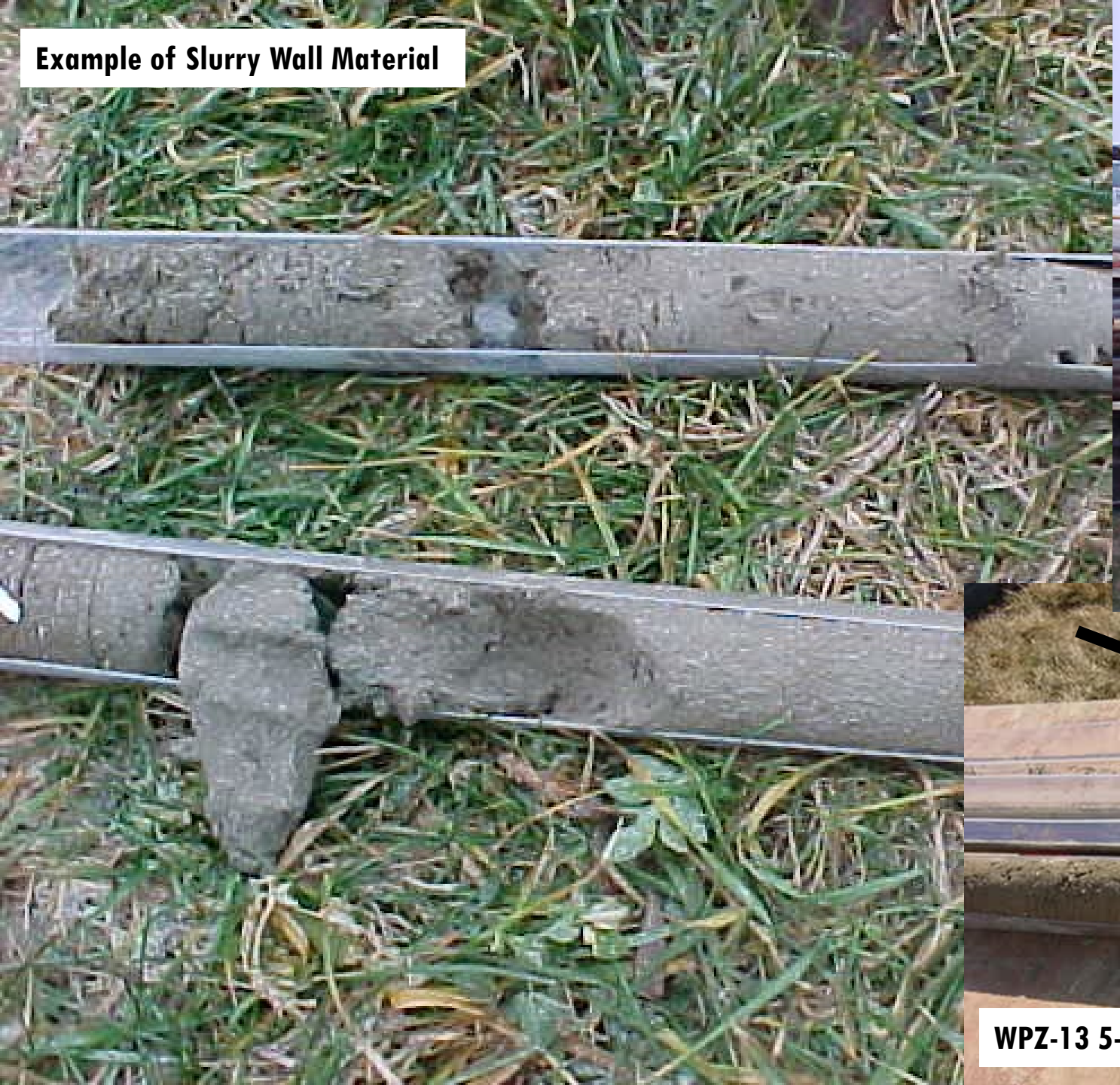
- 5 Piezometer Pairs Installed – 3 Downgradient, 2 Upgradient
- Hydraulic Gradient Analysis
  - Upgradient groundwater elevation differences on average <1 ft higher on the interior side
- Dye Tracer Study
  - No dye detected in exterior piezometers after injection on interior side of slurry wall
- Final MEC Conclusion – Slurry wall functioning as designed

MDEQ Phase I Slurry Wall Evaluation (upgradient only)

- Major Tasks
  - 2001 File review and site evaluation by Weston
  - Locate slurry wall
  - Install Piezometers
  - Characterize soil and groundwater inside and outside containment system
  - Initial evaluation of slurry wall and cap performance

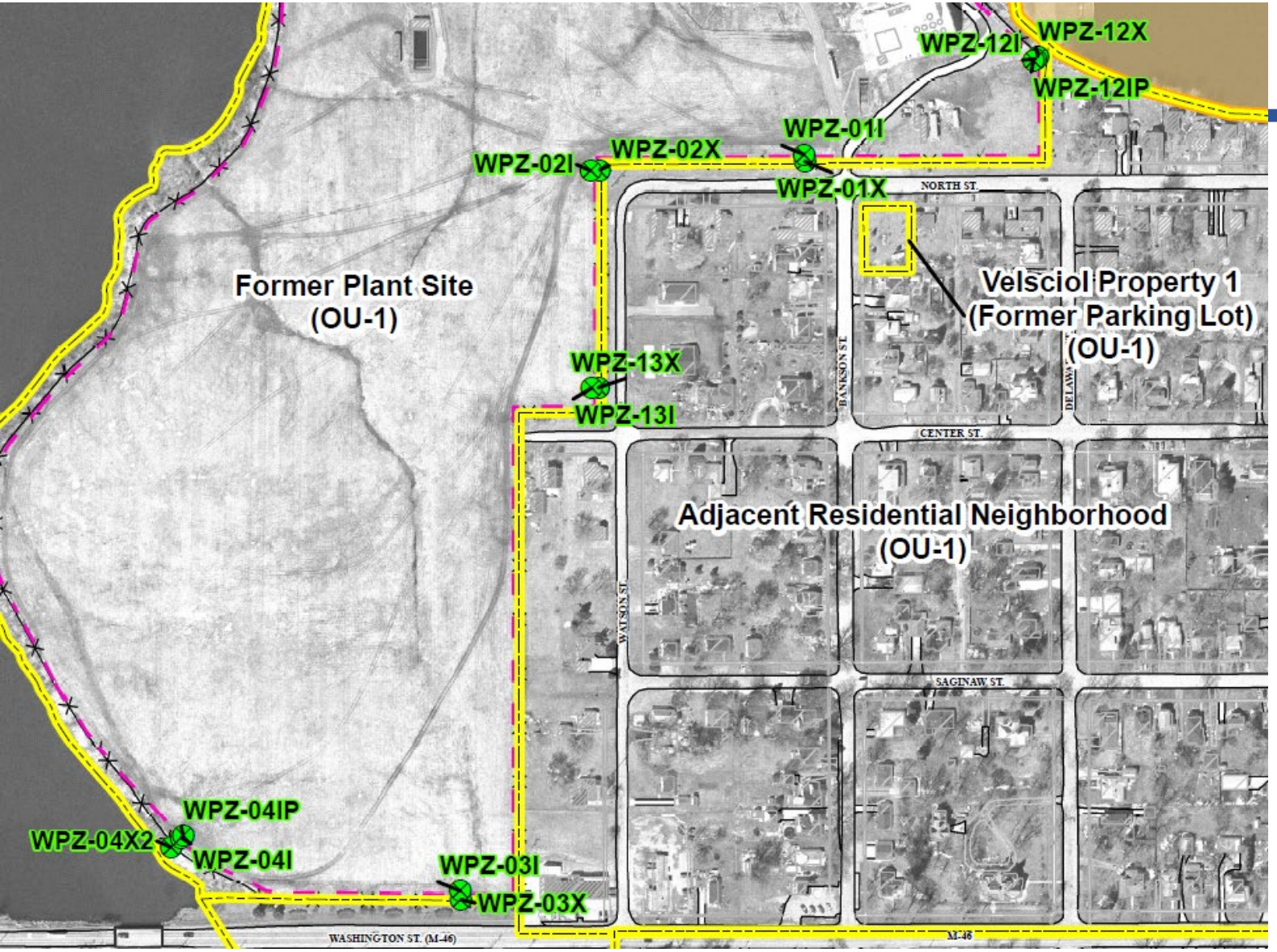
Slurry Wall Locating

- 80 investigative borings
- Installed on 2-ft centers on transects perpendicular to the slurry wall
  - Advanced to depths ranging from 5-10 ft
- Placed in locations of proposed permanent groundwater monitoring locations


Example of Slurry Wall Material


WPZ-01 Slurry Wall Boring

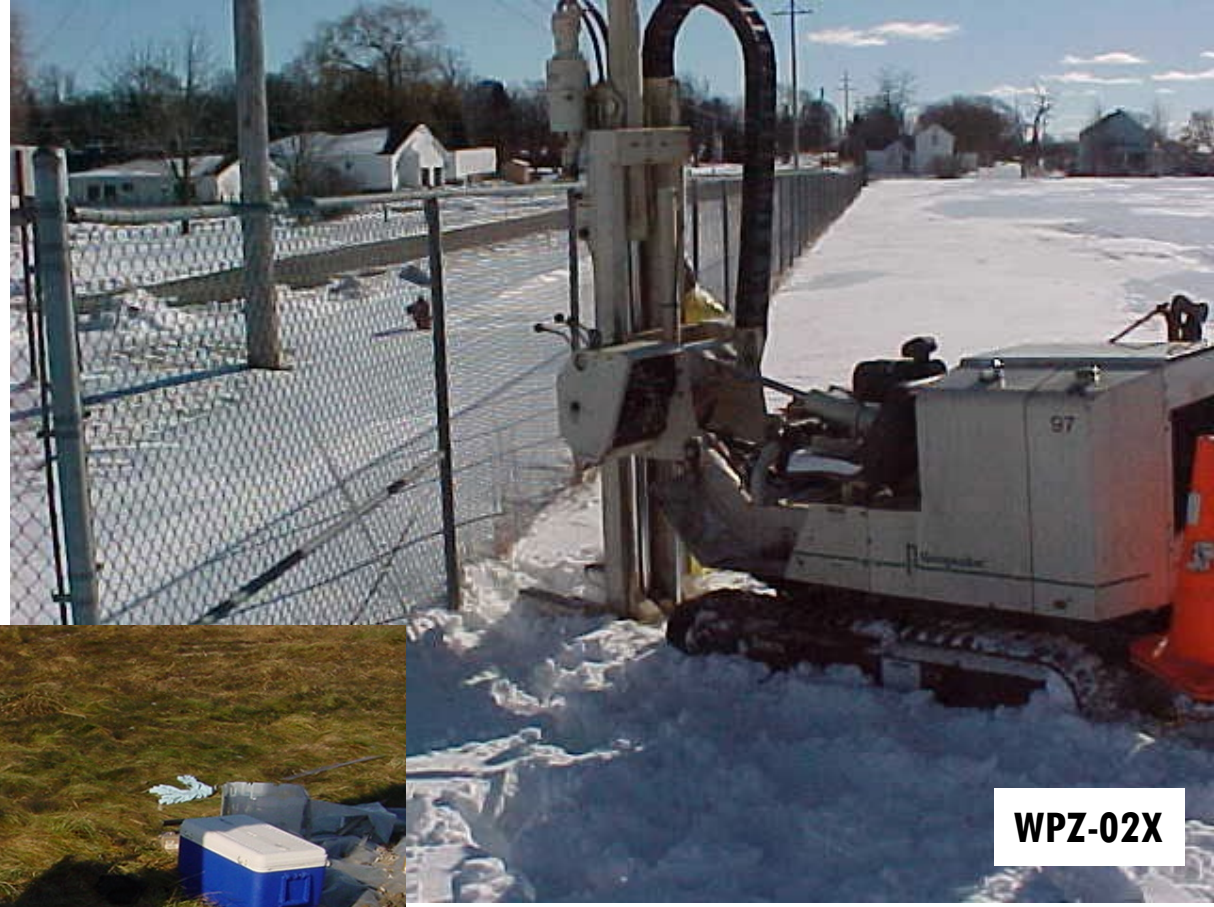

WPZ-13 5-10 ft Slurry Wall Material



Piezometer Installations

- 16 piezometer pairs
- Interior and exterior along the slurry wall
- 6 pairs along upgradient side
  - WPZ-01I/X
  - WPZ-02I/X
  - WPZ-03I/X
  - WPZ-04I/X
  - WPZ-12I/X
  - WPZ-13I/X

WPZ-13I and WPZ-13X



WPZ-02X

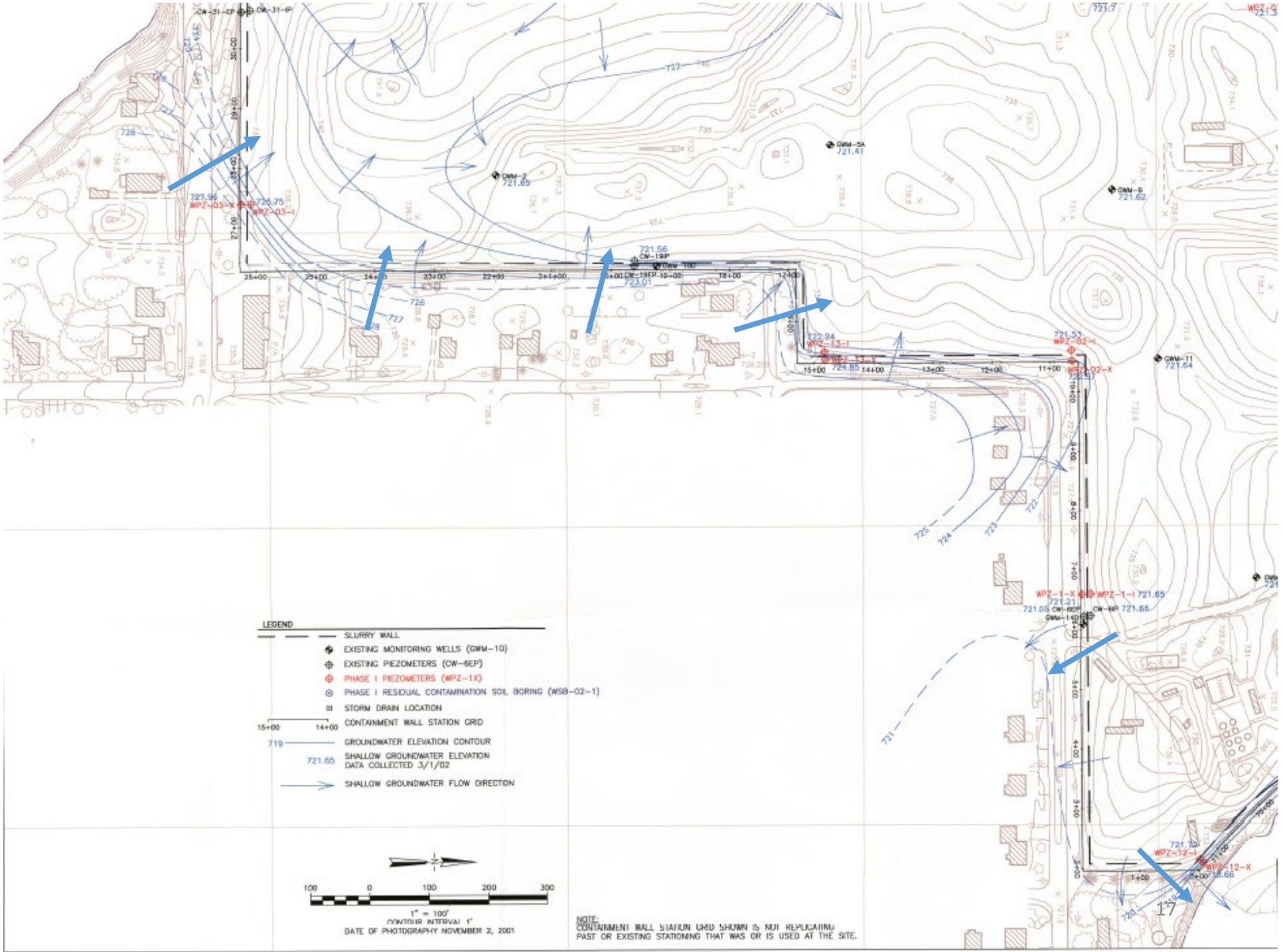
Piezometer Installation

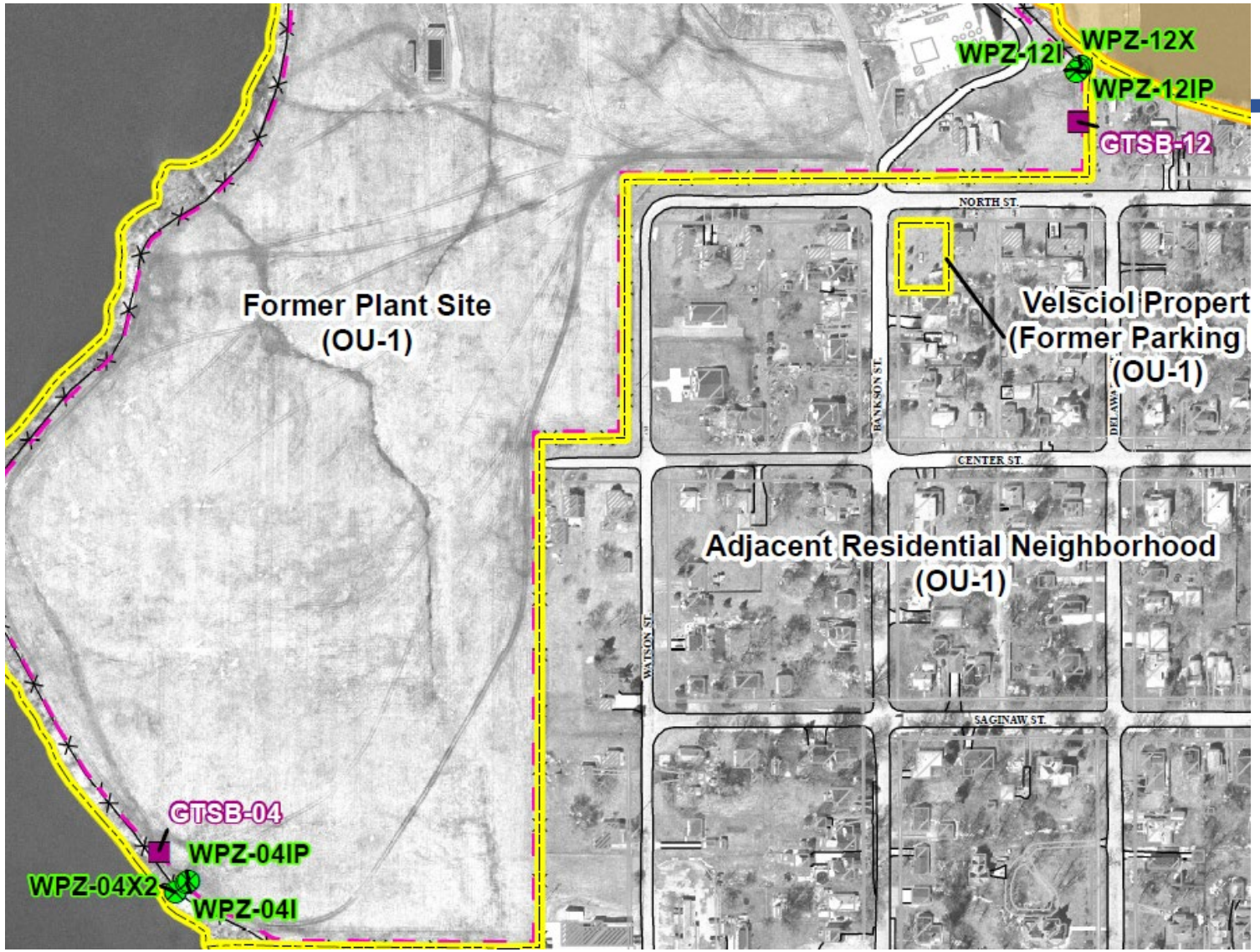
Piezometer Water Level Evaluation

- 4 rounds of water levels in March 2002
- Completed at a time when dewatering of the river was not occurring
- Water levels indicated inward gradient at most locations (i.e., water levels higher outside of slurry wall)
- Northeast portion of upgradient slurry wall showed outward gradient

Shallow Groundwater Flow

March 2002



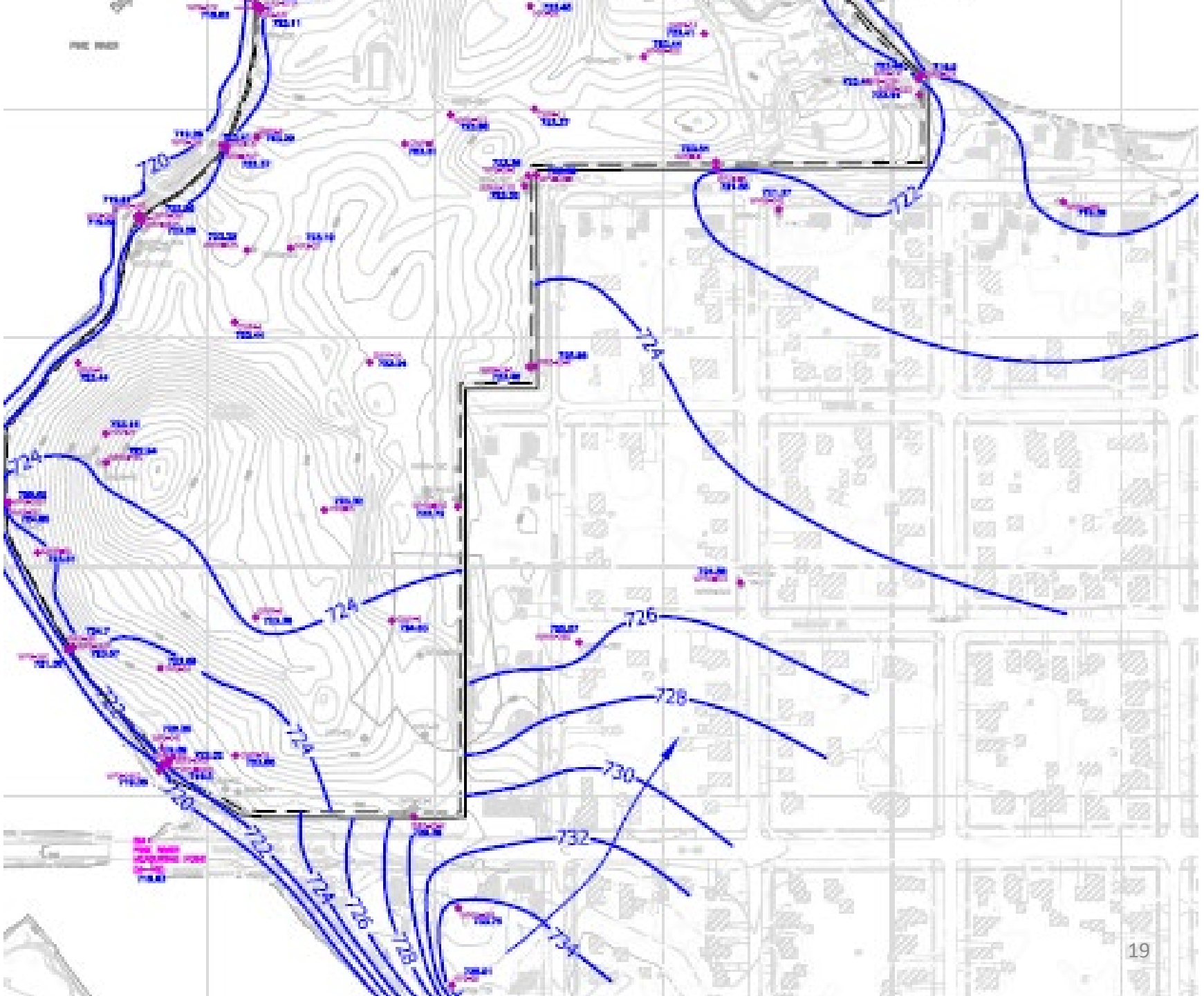


Phase II Evaluation

- Dye study and geotechnical borings at WPZ-04 and WPZ-12
- Dye injected on interior side of slurry wall not detected at exterior piezometer locations
- GTSB-04 (2 samples) and GTSB-12 (2 samples) do not meet permeability requirements (1.0×10^{-7})

Shallow Groundwater Flow

March 2008



Summary

- Dye Tests
  - Did not show leakage on upgradient side (only 2 locations tested)
- Permeability
  - 3 locations (6 samples) failed
  - 2 locations (7 samples) passed
- Water Quality
  - Some Detections on upgradient side (outside the wall)
  - Widespread groundwater contamination not identified
  - Inconclusive if contamination was present prior to slurry wall installation
- Hydraulic Gradient
  - 2002-2008 both inward and outward gradients were observed

Major Takeaways

- MEC study concluded the wall was functioning
- MDEQ evaluation indicated portions of the wall (upgradient only) may be working – data was inconclusive and limited
- Hydrogeological setting has changed significantly since studies
- Spatial data gaps along upgradient portion of slurry wall
- Dye tests and hydraulic gradient monitoring preferred lines of evidence

Questions?

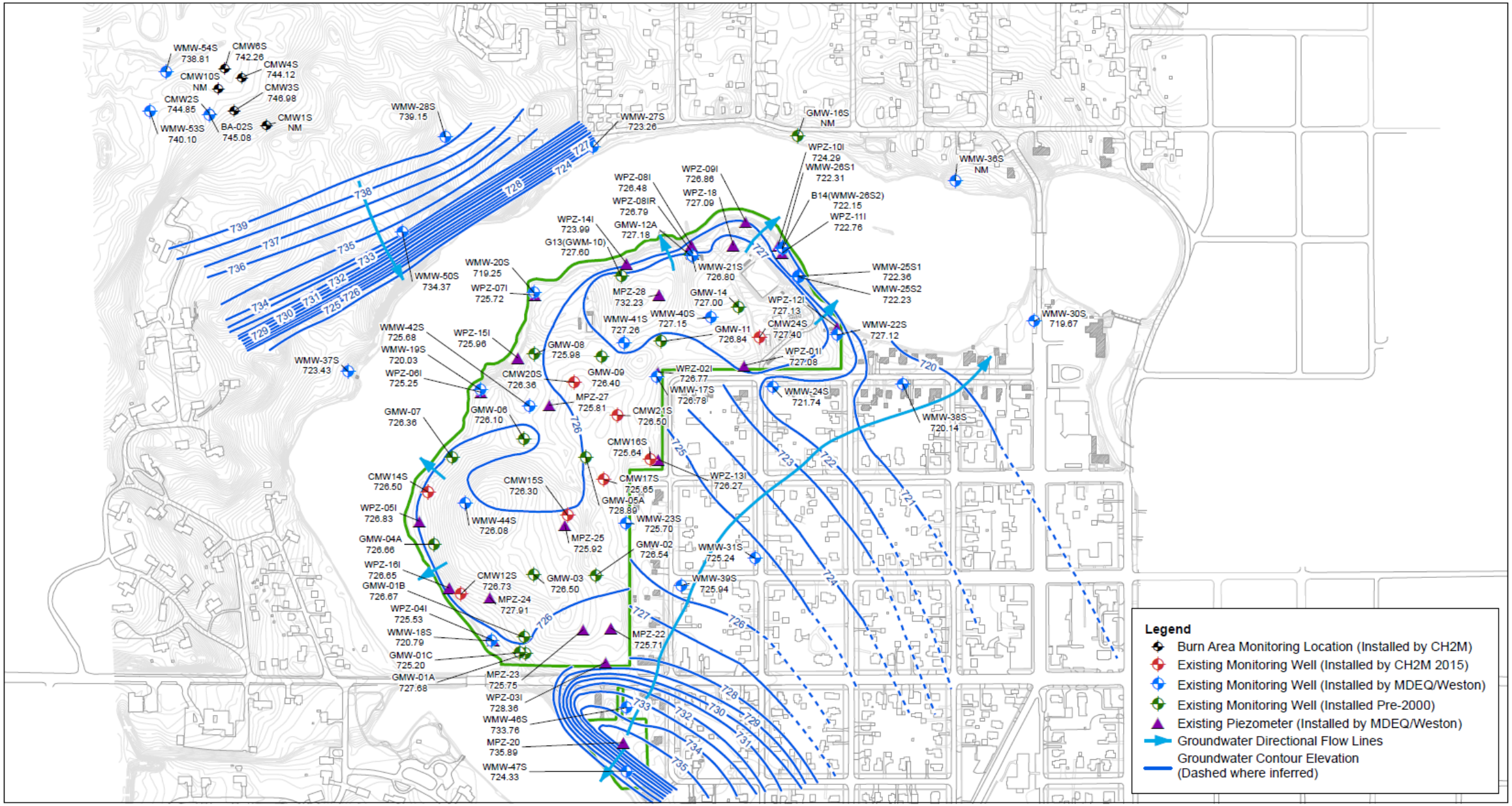
Velsicol Chemical Corporation Superfund Site

Former Plant Area – OU-1

Upgradient Slurry Wall Evaluation
Velsicol Chemical Superfund Site
August 21, 2019

Agenda

1. Objectives
2. Methodology
   - Piezometer installation and groundwater elevation data collection
   - Hydraulic conductivity sample collection and analysis
   - Dye tracer study
3. Data evaluation and reporting
4. Schedule



N

0 450 900 Feet

NOTES:

1. BASE MAP PROVIDED BY WESTON SOLUTIONS OF MICHIGAN, INC.
2. LAND SURVEY ELEVATIONS WERE REFERENCED TO NAVD OF 1988 FEET MSL. THE HORIZONTAL LOCATIONS WERE REFERENCED TO THE MICHIGAN STATE PLANE COORDINATE SYSTEM NAD83, INTERNATIONAL FEET - SOUTH (2113) ZONE.

Figure 3-8
Shallow Outwash Groundwater Elevation Contours - May 6, 2016
Velsicol Chemical Corporation Superfund Site
St. Louis, Michigan

ch2m:

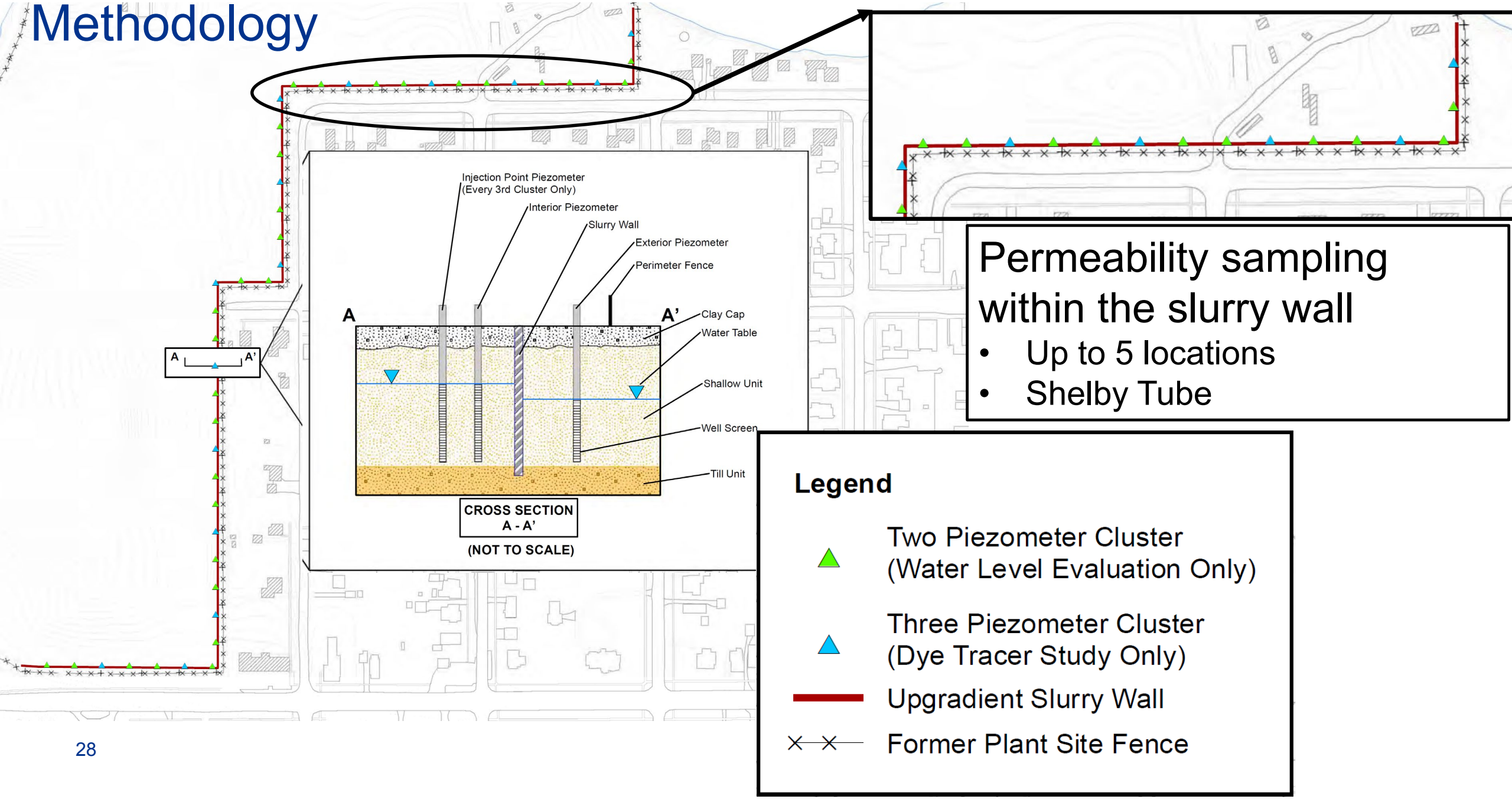
Objectives

- Evaluate the effectiveness of the upgradient slurry wall.
- Data evaluation to assist in design of perimeter containment and groundwater collection trench.
- Similar investigation methods to the previous slurry wall evaluations.
  - Memphis Environmental Center, Inc (MEC)
  - MDEQ/Weston Phase I and Phase II of the Remedial Investigation

Methodology

- Piezometer Installation and Groundwater Elevation Measurement
  - Direct push drilling (Geoprobe)
  - 45 piezometer clusters along the up-gradient slurry wall (UGSW).
    - Groundwater elevation measurements (30).
    - Dye tracer study (15).

Methodology



Permeability sampling within the slurry wall

- Up to 5 locations
- Shelby Tube

Legend

- Two Piezometer Cluster (Water Level Evaluation Only)
- Three Piezometer Cluster (Dye Tracer Study Only)
- Upgradient Slurry Wall
- Former Plant Site Fence

Methodology- Dye Tracer Study

- Charcoal dye receptors deployed to assess background dye presence.
- Dye selection and injection volume determined in consultation with the analytical laboratory.
- Tracer dye injection.
- Charcoal dye receptors deployed
- Charcoal dye receptors retrieved and replaced every two weeks for an initial period of 3 months.
- Based on the preliminary data-the sampling schedule may be extended for an additional 1 to 2 months.

Data Evaluation

- Dye receptor results -Presence or absence of the injection dye(s).
- Groundwater elevation differences interior vs exterior.
- Determine if additional design investigation is required.

Schedule

- Piezometer installation- September 2019
- Background dye evaluation-October 2019
- Dye Injections- Late October 2019
- Dye tracer sample collection- November 2019, December 2019, January 2020.
- Groundwater elevation measurement-throughout investigation.
- Reporting- February and March 2020
- Path forward- April 2020

Questions